Rockwell International

instruction book

Collins Telecommunications Products Division

Collins 312B-4 and 312B-5 Station Controls

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ADDENDUM 1 TO THE 312B-4 AND 312B-5 STATION CONTROLS INSTRUCTION BOOK

(523-0179000-007311)

GENERAL

The purpose of this addendum is to convert all measurements in the 312B-4 and 312B-5 instruction book to the dual measurement system (metric (customary)).

2.1 Installation

In paragraph 2.1.1, change "five feet" to "1.52 metres (5 feet)".

The attached figure 3 has been revised to show dual measurements (millimetres (inches)).

In paragraph 2.1.2, change "two inches" to "50.8 mm (2 in)".

5.1 Specifications

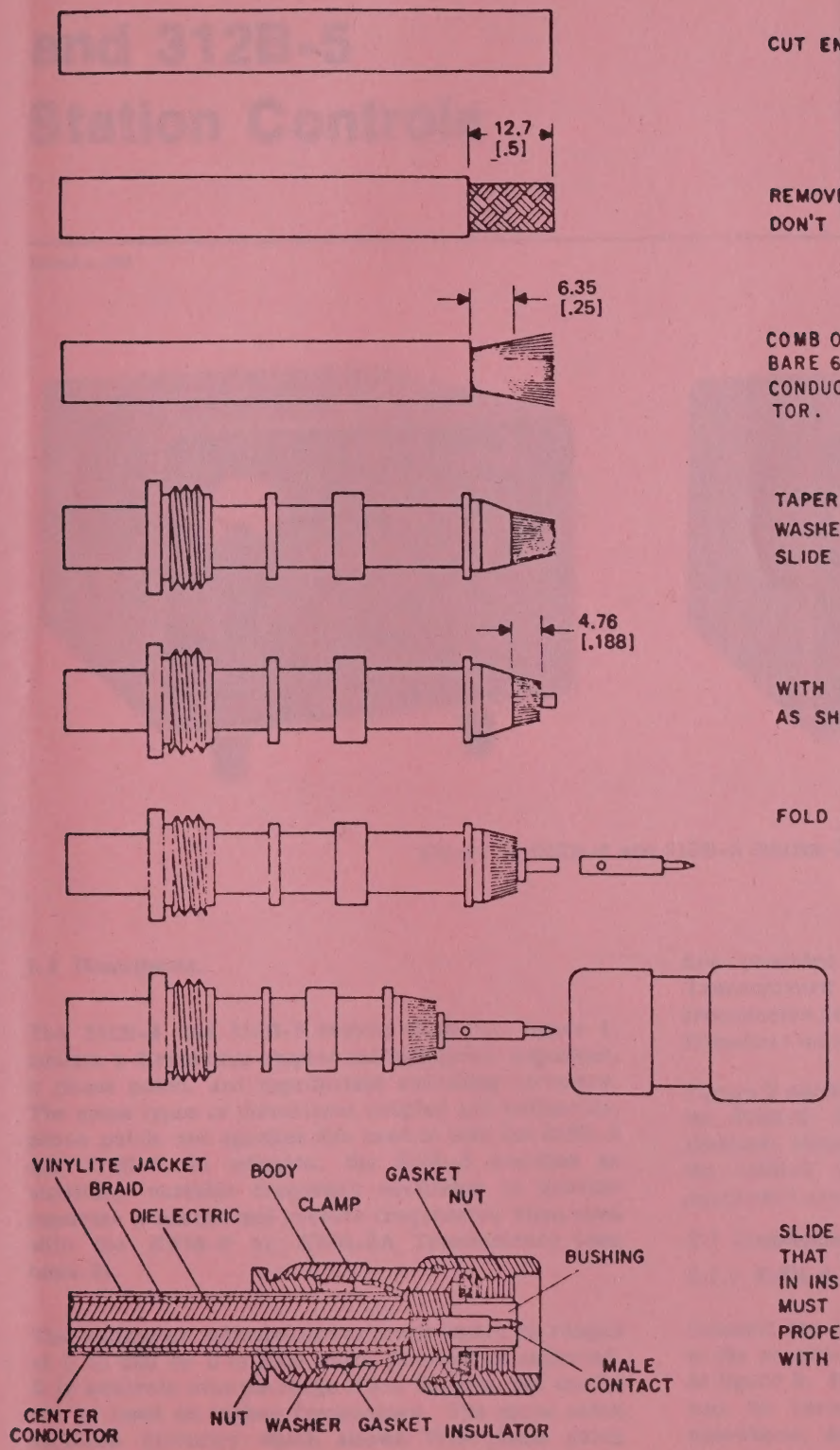
In paragraph 5.1.1, change the Size and Weight as follows:

Size--------273 mm (10-3/4 in) w X 191 mm (7-1/2 in) h X 298 mm (11-3/4 in) d including feet.

Weight------3.86 kg (8-1/2 lbs).

In paragraph 5.1.3, change the Size as follows:

Size--------127 mm (5 in) by 178 mm (7 in).



CUT END OF CABLE EVEN.

REMOVE VINYL JACKET 12.7 [.5] INCH-DON'T NICK BRAID.

COMB OUT COPPER BRAID AS SHOWN. BARE 6.35 [.25] INCH OF CENTER CONDUCTOR. DO NOT NICK CONDUCTOR.

TAPER BRAID AS SHOWN. SLIDE NUT, WASHER AND GASKET ON VINYL JACKET. SLIDE CLAMP ON BRAID.

WITH CLAMP IN PLACE, TRIM BRAID AS SHOWN.

FOLD COPPER BRAID BACK ON CLAMP. TIN CENTER CONDUCTOR, USING MINIMUM AMOUNT OF HEAT.

HOLDING CONTACT WITH PLIERS, SOFT SOLDER CONTACT TO CENTER CONDUCTOR. IT IS IMPERATIVE THAT BACK END OF CONTACT BE FLUSH WITH POLYETHYLENE DIELECTRIC. DO NOT USE EXCESS SOLDER. WIPE CLEAN- SEE THAT END OF CABLE INSULATOR IS CLEAN AND FREE OF SOLDER, ROSIN AND FOREIGN MATERIAL.

SLIDE BODY INTO PLACE CAREFULLY SO THAT CENTER CONDUCTOR ENTERS HOLE IN INSULATOR. FACE OF CABLE DIELECTRIC MUST FIT FLUSH AGAINST INSULATOR. PROPERLY TIGHTEN BODY AND NUT WITH WRENCHES.

C64-03-4

Figure 3. Installation of Type N Male Connectors on RG-8/U Transmission Lines

Collins 312B-4 and 312B-5 Station Controls

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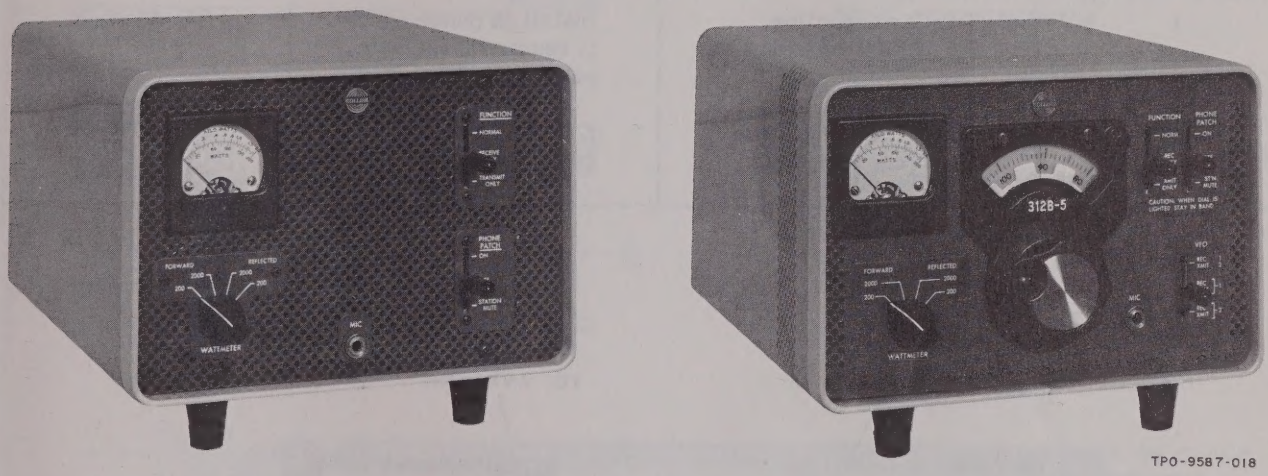

Figure 1. 312B-4 and 312B-5 Station Controls

1.1 Description.

The 312B-4 and 312B-5 Station Controls, figure 1, contain a directional coupler and wattmeter, a speaker, a phone patch, and appropriate switching circuitry. The same types of directional coupler and wattmeter, phone patch, and speaker are used in both the 312B-4 and 312B-5. In addition, the 312B-5 contains an auxiliary variable frequency oscillator to provide separate transmit and receive frequencies when used with the KWM-2 or KWM-2A Transceivers (see table 3).

The wattmeter indicates power levels within the ranges of 0 to 200 or 0 to 2000 watts, forward or reflected. It is accurate over the range of 2 to 30 MHz, but should not be used on higher frequencies. The phone patch includes circuitry which allows VOX phone patch operation. It can also be switched manually if desired. The vfo in the 312B-5 is the same as that used in KWM-2/2A and S-Line equipment. Switching circuits are provided to allow operation of KWM-2/2A Transceivers on different transmit and receive frequencies or transmit-receive operation on the same frequency using either vfo.

Figure 2 shows the location of external connections to the 312B-5. The 312B-4 and 312B-5 are electrically identical except for the absence of vfo connections in the 312B-4. Items which are furnished with each equipment are listed in table 1.

2.1 Installation.

2.1.1 312B-4 WITH S-LINE OR KWM-2/2A.

Connect the phone patch, speaker, and rf wattmeter to the receiver, exciter, and telephone lines as shown in figure 4. If necessary, the directional coupler unit can be removed from the 312B-4 and mounted elsewhere, provided the cable leads are less than five feet long. Figure 7 shows 312B-4 and KWM-2/2A interconnections. Figure 8 shows the proper way to connect the directional coupler to the indicator circuit.

TABLE 1. ITEMS FURNISHED WITH 312B-4 AND 312B-5

QUANTITY	DESCRIPTION	FUNCTION	PART NUMBER
1	Right-angle connector, rf type N	Antenna connection	357-9113-00
1	RG-58C/U cable with phono and N-connectors	Connect transmitter to coupler	426-6026-00
5	Audio cables with phono connectors	Interconnections	426-2027-00
1	Tubular capacitor, 0.5 uf, 200 volts dc	Install in phone patch if required (see note, paragraph 3.1.2.h)	931-0169-00
1 (312B-5 only)	RG-58C/U cable with phono connectors	External vfo connection	426-5076-00

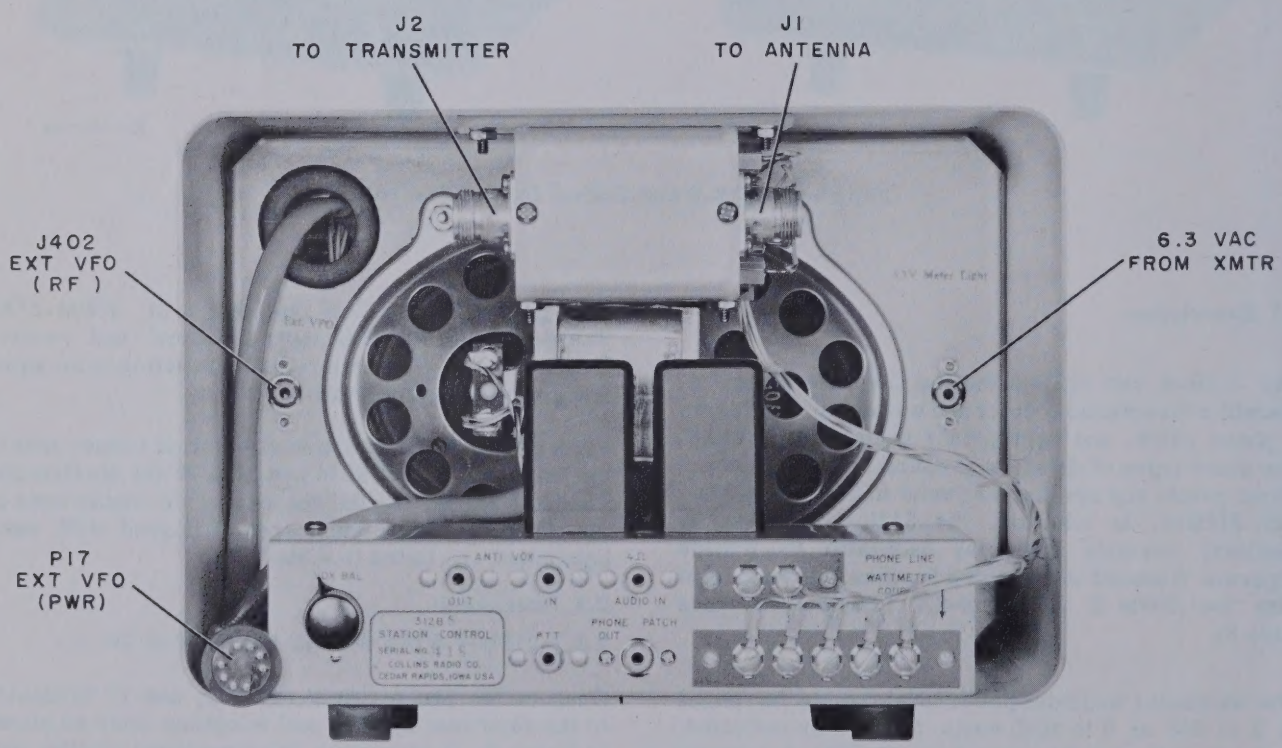

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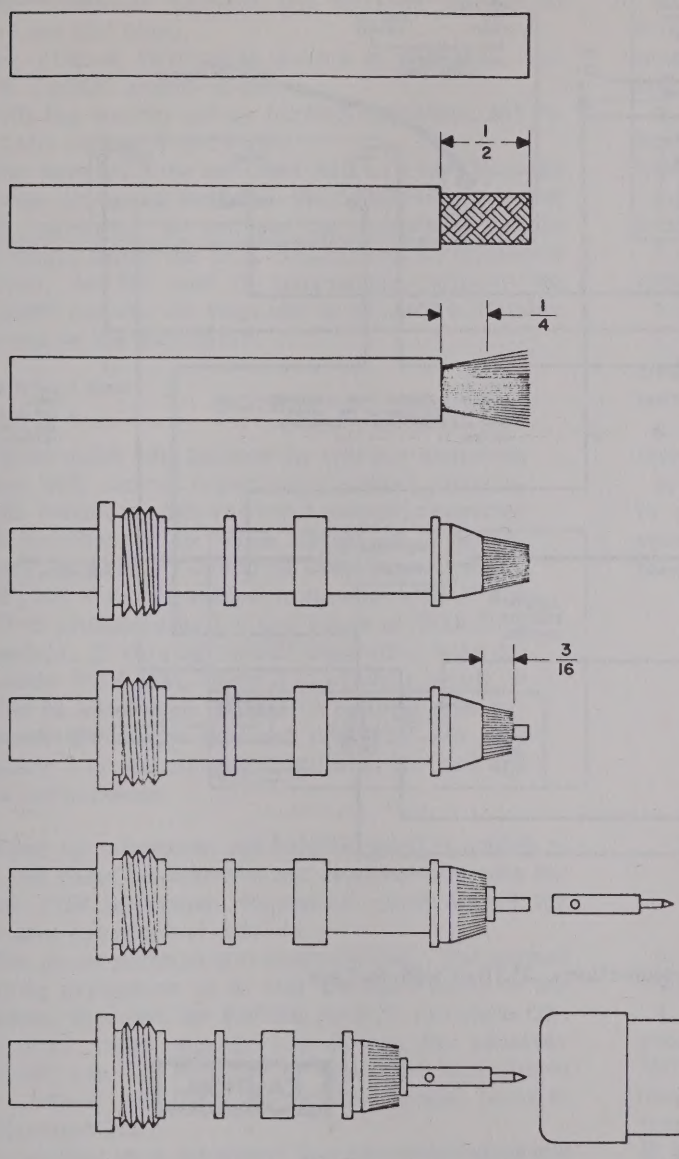
Figure 2. 312B-5, External Connections



CUT END OF CABLE EVEN.

REMOVE VINYL JACKET $\frac{1}{2}$ INCH— DON'T NICK BRAID.

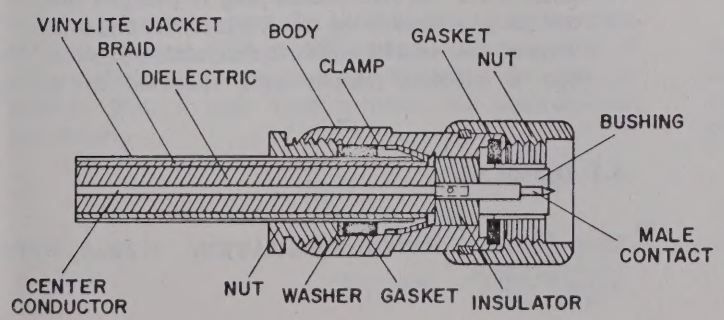
COMB OUT COPPER BRAID AS SHOWN. BARE $\frac{1}{4}$ INCH OF CENTER CONDUCTOR. DON'T NICK CONDUCTOR.

TAPER BRAID AS SHOWN. SLIDE NUT, WASHER AND GASKET ON VINYL JACKET. SLIDE CLAMP ON BRAID.

WITH CLAMP IN PLACE, TRIM BRAID AS SHOWN.

FOLD COPPER BRAID BACK ON CLAMP. TIN CENTER CONDUCTOR, USING MINIMUM AMOUNT OF HEAT.

HOLDING CONTACT WITH PLIERS, SOFT SOLDER CONTACT TO CENTER CONDUCTOR. IT IS IMPERATIVE THAT BACK END OF CONTACT BE FLUSH WITH POLYETHYLENE DIELECTRIC. DO NOT USE EXCESS SOLDER. WIPE CLEAN- SEE THAT END OF CABLE INSULATOR IS CLEAN AND FREE OF SOLDER, ROSIN AND FOREIGN MATERIAL.



SLIDE BODY INTO PLACE CAREFULLY SO THAT CENTER CONDUCTOR ENTERS HOLE IN INSULATOR. FACE OF CABLE DIELECTRIC MUST FIT FLUSH AGAINST INSULATOR. PROPERLY TIGHTEN BODY AND NUT WITH WRENCHES.

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Figure 3. Installation of Type N Male Connectors on RG-8/U Transmission Lines

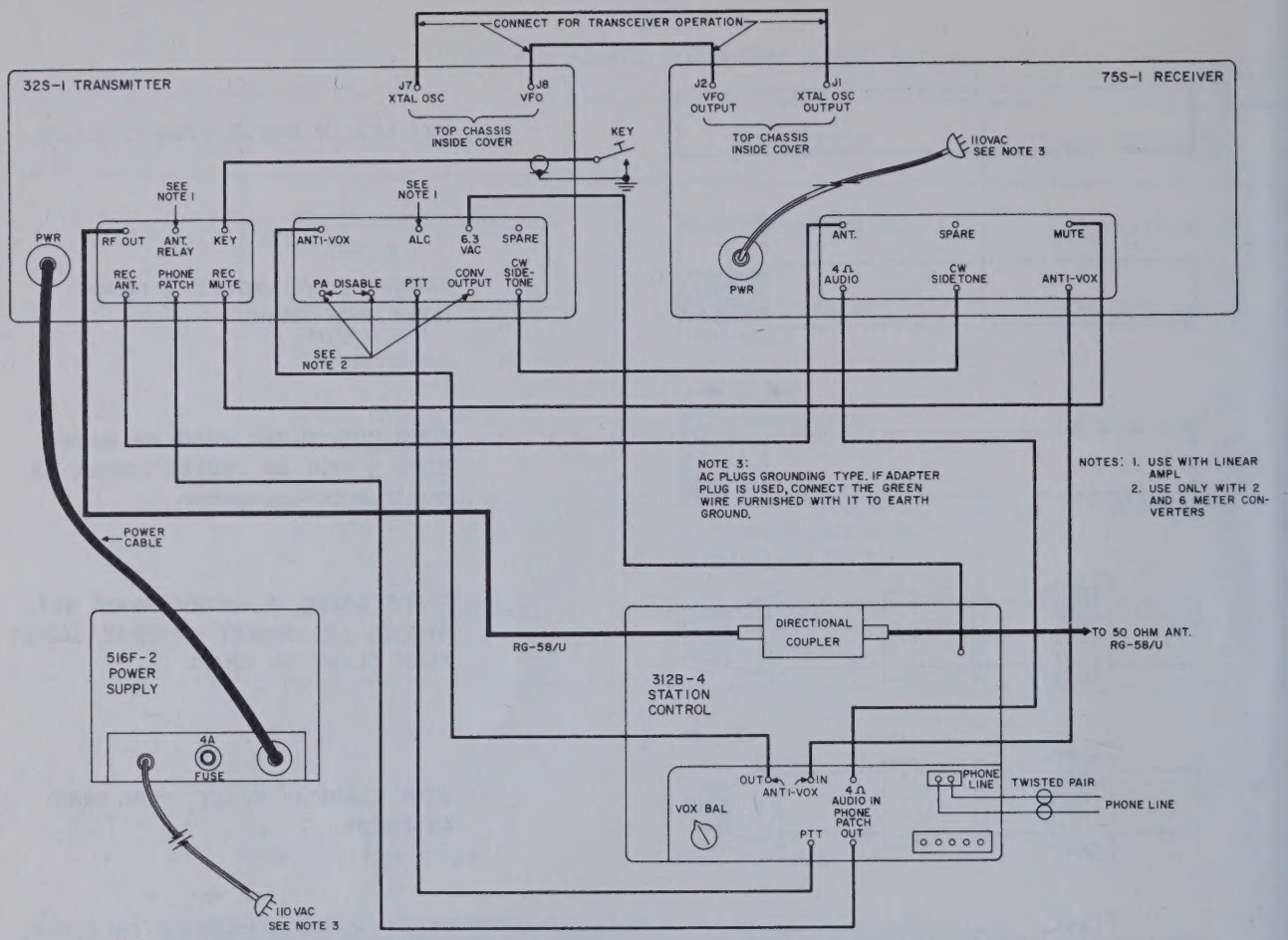

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Figure 4. Interconnections, 312B-4 with S-Line

NOTE

If the phone patch is to be used with a receiver other than an S-Line type, connect the ANTI-VOX IN jack on the 312B-4/5 to a 500-ohm audio output line from the receiver. Use a 500-ohm-to-voice-coil matching transformer if the receiver has no 500-ohm output. Other types of exciters may be used by connecting the PHONE PATCH OUT jack on the 312B-4/5 to the exciter microphone jack. The output voltage at this jack on the phone patch is approximately equal to that of the average high-impedance dynamic microphone.

2.1.2 312B-5 WITH KWM-2 OR KWM-2A.

Connect the power, phone patch, speaker, vfo, and rf wattmeter to the transceiver and telephone lines as shown in figure 6. Use the RG-58C/U cables supplied for the rf connections. These cables are slightly larger in diameter and two inches shorter than those supplied for audio and control functions.

CAUTION

Make sure the vfo power plug is plugged into the proper socket on the KWM-2/2A chassis. This socket is J17 which, for normal operation, has a molded jumper plug inserted in it.

3.1 Operation.

3.1.1 PHONE PATCH OPERATION: 312B-4 WITH S-LINE.

a. If the receiver and exciter are set up for transceive operation, disconnect the patch cables, and restore to fully independent operation.

b. Tune and load the exciter into an antenna or dummy load according to the exciter instruction book.

c. Set the receiver to a different band than that being used by the exciter, and tune to the calibrate signal to produce approximately a 900-Hz audio tone.

d. Lift telephone handset and dial one number to remove the dial tone.

e. Set 312B-4 FUNCTION switch to NORMAL and PHONE PATCH switch to ON.

f. With the exciter set up for SSB operation, set its VOX GAIN control to PTT ON.

g. The tone from the receiver will now feed through the phone patch and modulate the transmitter. Using the rf wattmeter to indicate the magnitude of this feedthrough, adjust the VOX BAL control for minimum rf output. As the null is approached, advance the MIC GAIN control as required to produce a suitable indication on the wattmeter.

NOTE

Phone patch will balance on average telephone line with circuit capacities provides. Unusual line conditions may require a change in capacity to compensate for these conditions. If necessary, remove C7 or add the extra capacitor (0.5 μF, 200 V dc, furnished) in parallel with C6 and C7 to produce a null within range of VOX BAL control. If varying circuit capacities does not enable VOX BAL control to produce a null, it may be necessary to insert a 6-db "H" pad between the phone line and the 312B-4/5. See figure 5 for the circuit of a suitable "H" pad and its connections.

h. Hang up telephone, set PHONE PATCH switch to OFF, and reset transmitter and receiver controls for normal VOX operation. Reconnect patch cables for transceive operation if desired.

i. The phone patch is now ready for use. The normal operating procedure is to call the third party on the telephone, then set the PHONE PATCH switch to ON. If received radio signals are strong, the receiver RF GAIN can be reduced to minimize background noise. Adjust AF GAIN to provide normal level to the telephone line.

j. Depending upon telephone line characteristics and the voice volume of the incoming telephone signal, it may be necessary to make adjustments of transmitter MIC GAIN and VOX GAIN controls. In the case of extremely weak signals from the telephone line or signals with a high hum content, use push-to-talk operation.

3.1.2 PHONE PATCH OPERATION: 312B-4/5 WITH KWM-2 OR KWM-2A.

a. Set EMISSION switch to LSB, ANTIVOX GAIN at minimum, MIC GAIN at minimum, VOX GAIN at minimum, and RF GAIN and AF GAIN as required for normal operation.

b. Set function switch to CAL, and tune in the calibrate signal to produce approximately a 900-Hz audio tone.

c. Set VOX BAL control on 312B-4/5 to full counterclockwise.

d. Lift telephone handset, and dial a single digit to remove dial tone.

e. Set PHONE PATCH switch to ON.

f. Advance VOX GAIN control on the transceiver until the VOX relays begin to trip back and forth between receive and transmit positions.

g. Slowly adjust VOX BAL control until the relays stop tripping.

h. Repeat steps f and g until it is no longer possible to advance the VOX GAIN control without causing the relays to trip. (If phone patch will not balance, refer to note accompanying step g of paragraph 3.1.1.)

NOTE

More precise balancing may be obtained if an ac vtvm is used. Connect the vtvm from the PHONE PATCH OUT jack (J4 on 312B-5) to ground. Slowly adjust the VOX BAL control for a null as indicated by the vtvm.

i. Hang up telephone, turn off phone patch, and reset all transceiver controls for normal VOX SSB operation.

j. The phone patch is now ready for use. Normal procedure is to set PHONE PATCH switch to STATION MUTE and call the third party on the telephone. Switch the phone patch on, and adjust AF GAIN on the transceiver to provide normal telephone line level. If the received signal is strong, the RF GAIN can be decreased to reduce background noise.

k. Depending upon telephone line characteristics and the voice volume of the incoming telephone signal, it might be necessary to make adjustments of MIC GAIN and VOX GAIN. In case of extremely weak signals from the telephone line or signals with a high hum

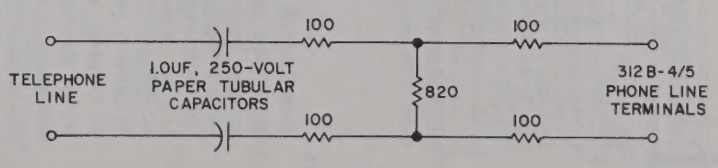
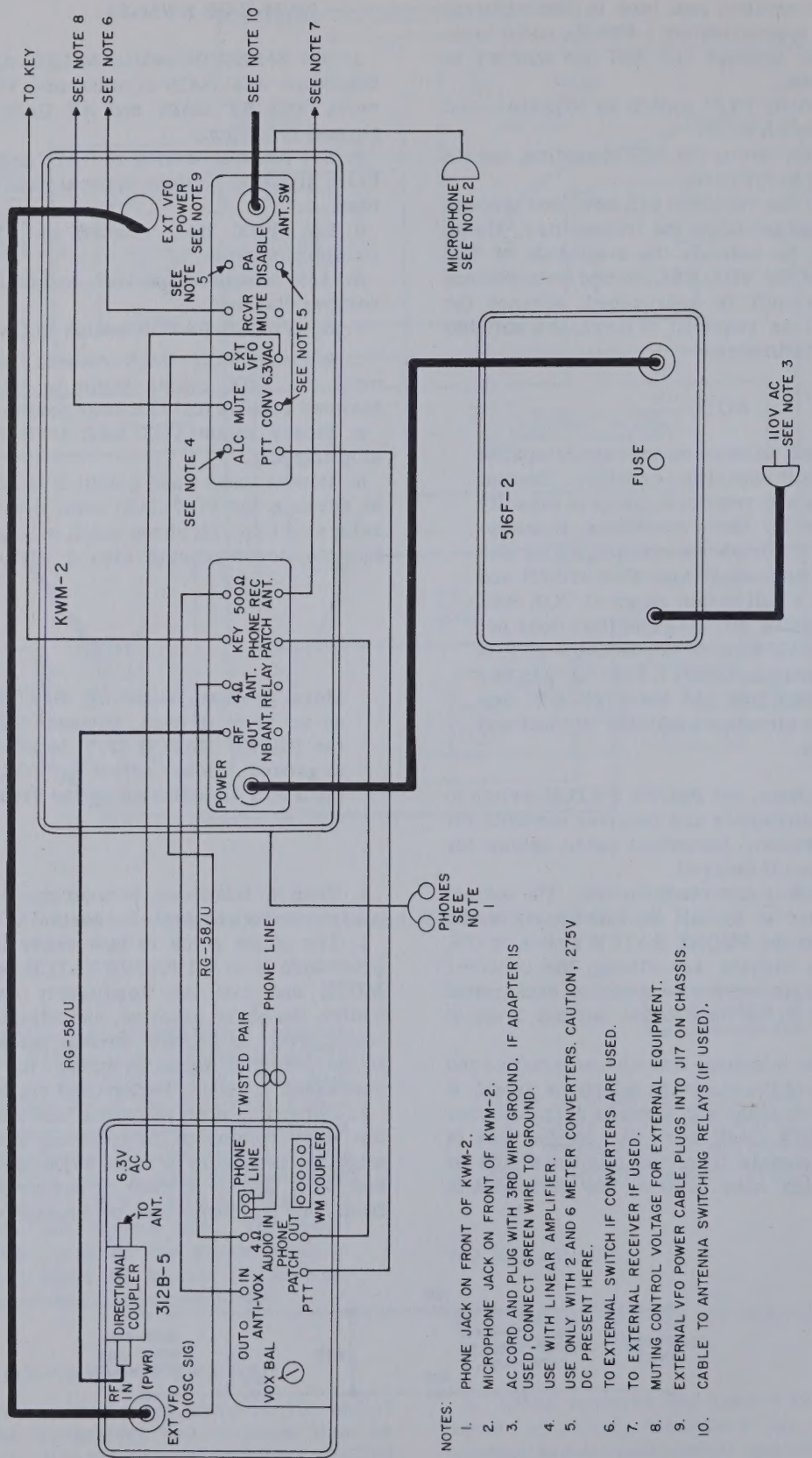


Figure 5. 6-db "H" Pad



NOTES:

1. PHONE JACK ON FRONT OF KWM-2.
2. MICROPHONE JACK ON FRONT OF KWM-2.
3. AC CORD AND PLUG WITH 3RD WIRE GROUND. IF ADAPTER IS USED, CONNECT GREEN WIRE TO GROUND.
4. USE WITH LINEAR AMPLIFIER.
5. USE ONLY WITH 2 AND 6 METER CONVERTERS. CAUTION, 275V DC PRESENT HERE.
6. TO EXTERNAL SWITCH IF CONVERTERS ARE USED.
7. TO EXTERNAL RECEIVER IF USED.
8. MUTING CONTROL VOLTAGE FOR EXTERNAL EQUIPMENT.
9. EXTERNAL VFO POWER CABLE PLUGS INTO J17 ON CHASSIS.
10. CABLE TO ANTENNA SWITCHING RELAYS (IF USED).

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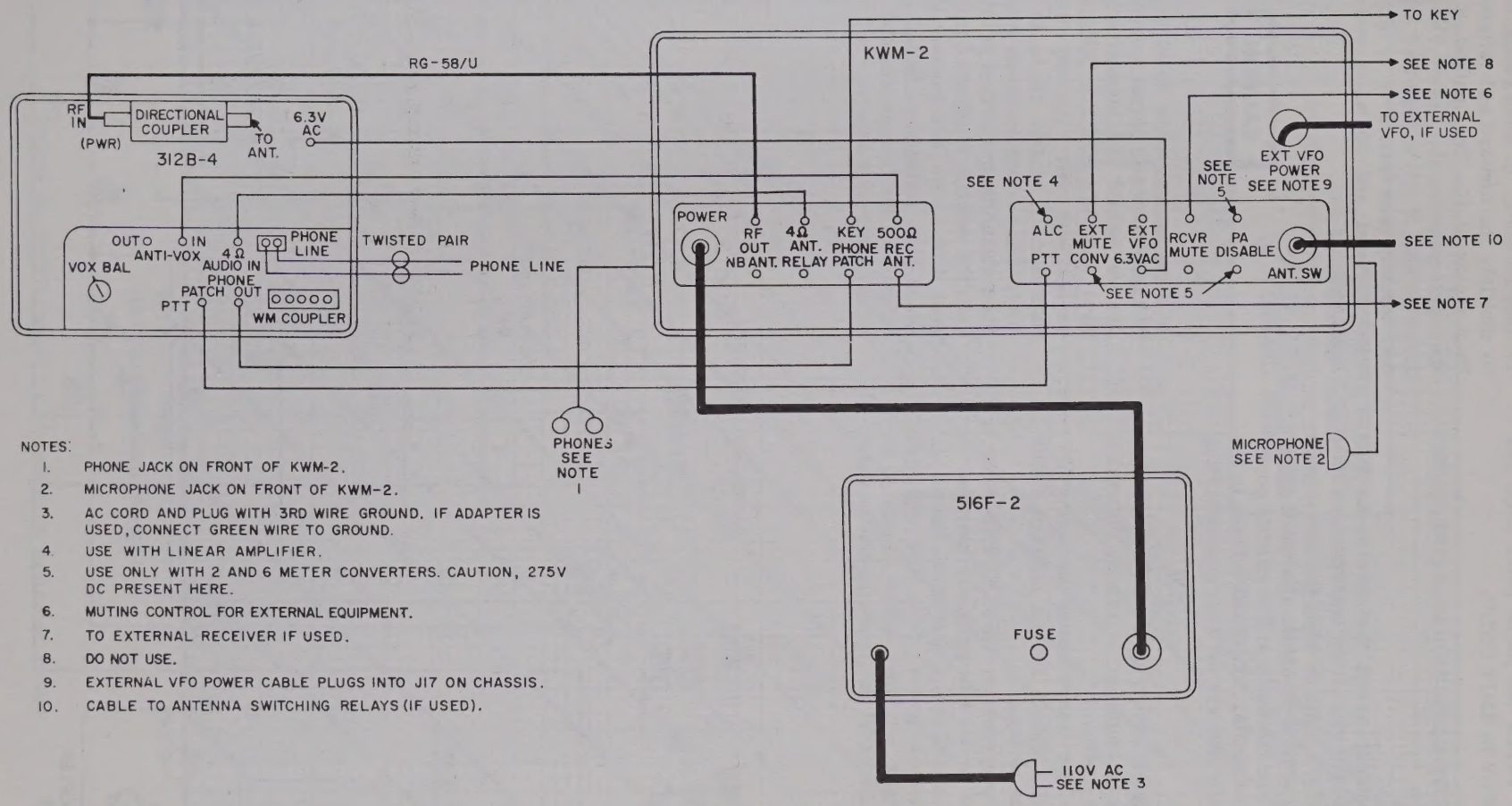
Figure 6. Interconnections, 312B-5 with KWM-2/2A



NOTES:

1. PHONE JACK ON FRONT OF KWM-2.
2. MICROPHONE JACK ON FRONT OF KWM-2.
3. AC CORD AND PLUG WITH 3RD WIRE GROUND. IF ADAPTER IS USED, CONNECT GREEN WIRE TO GROUND.
4. USE WITH LINEAR AMPLIFIER.
5. USE ONLY WITH 2 AND 6 METER CONVERTERS. CAUTION, 275V DC PRESENT HERE.
6. MUTING CONTROL FOR EXTERNAL EQUIPMENT.
7. TO EXTERNAL RECEIVER IF USED.
8. DO NOT USE.
9. EXTERNAL VFO POWER CABLE PLUGS INTO J17 ON CHASSIS.
10. CABLE TO ANTENNA SWITCHING RELAYS (IF USED).

C487-45-4

Figure 7. Interconnections, 312B-4 with KWM-2/2A

content, manually switch the phone patch back and forth from REC ONLY to XMIT ONLY.

3.1.3 OPERATION OF DIRECTIONAL COUPLER AND WATTMETER.

The transmitter output power that can be handled safely is relative to the swr on the transmission line. If the swr is extremely high, as when the line is open or shorted, it is possible to obtain a forward power indication of up to two kilowatts with very little power output from the transmitter. To avoid damage to the instrument, carefully observe the following operating procedure:

a. Set the wattmeter switch to the FORWARD 200 position. (If a linear amplifier is in use, set switch to FORWARD 2000 position.)

b. Couple rf into the transmission line using CW emission. The meter should show a forward power indication. Note the reading.

c. Switch to the appropriate REFLECTED scale. Unless the antenna or load is perfectly matched to the transmission line (52 ohms, resistive), the meter will indicate reflected power. Note the reading.

d. The forward and reflected power readings, in conjunction with the chart of figure 9, can be used to compute vswr. In some cases, it will be convenient to multiply the forward and reflected power readings by a factor of 10. The method of reading swr from the chart remains the same. For example, 50 watts forward and 5 watts reflected result in a value of swr slightly less than 2 to 1. Power levels of 500 watts forward and 50 watts reflected produce the same value of swr.

CAUTION

In applications where doubt exists in regard to expected power output from the transmitter, always select the highest wattmeter scale first and, if necessary, switch to the lower scale. This will prevent damage to the indicator. If testing is to be done with the transmitter connected to an antenna, the initial tests should be performed at low power levels until the antenna is adjusted for an swr of less than 2 to 1. An swr greater than 2 to 1 will cause high voltages to build up in the output circuits of the transmitter and possibly cause an arc-over or a short.

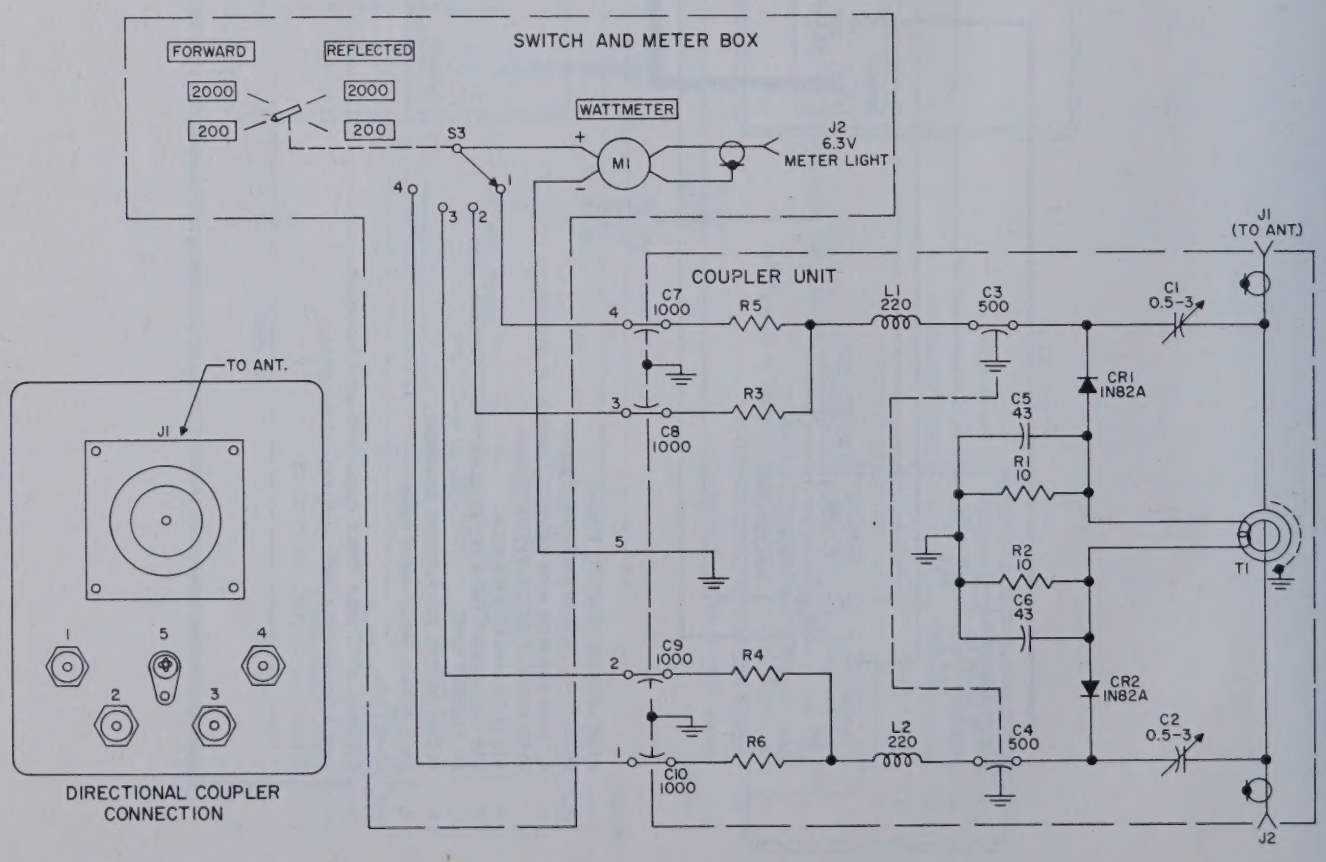


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Figure 8. Wattmeter Interconnections

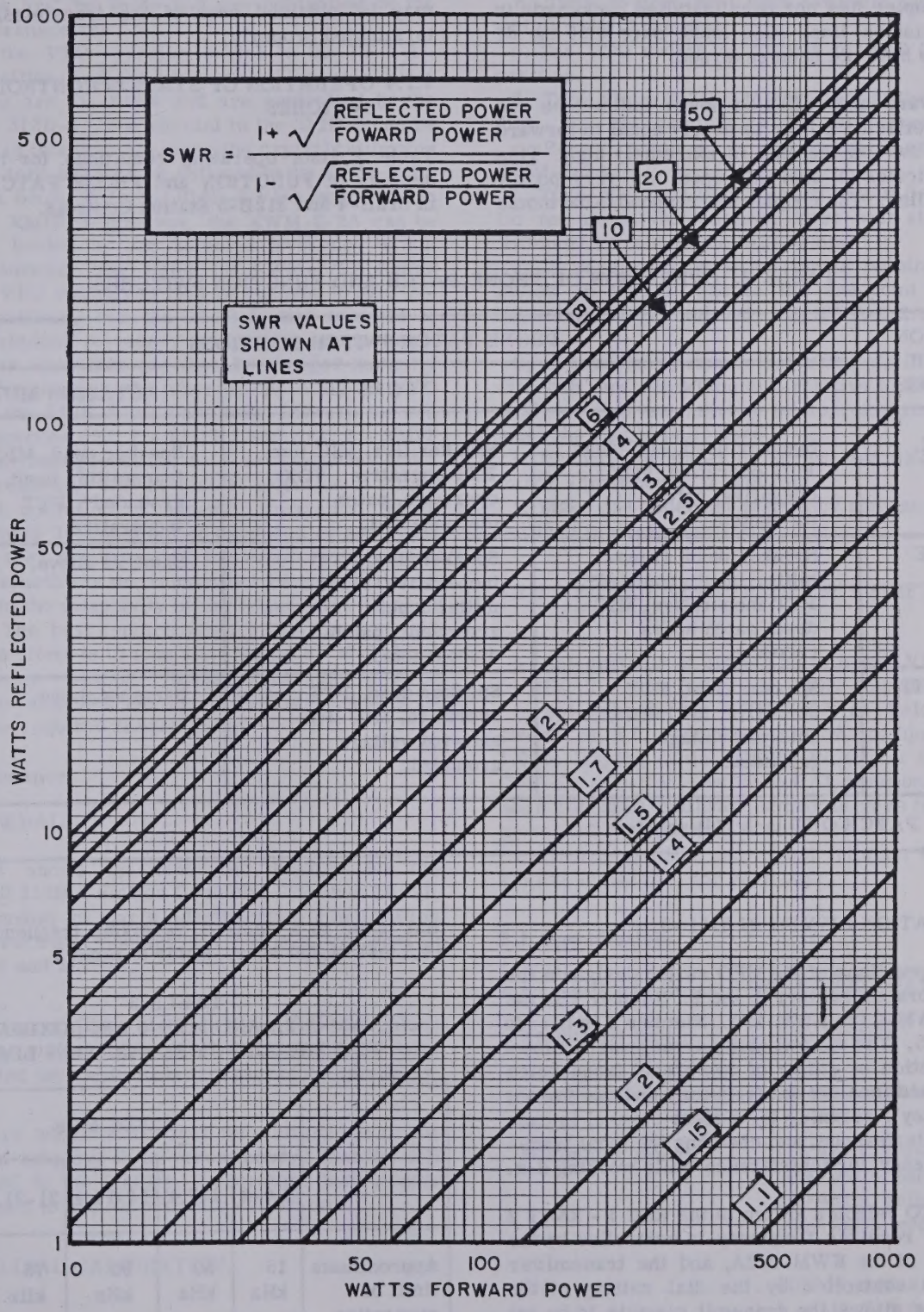


Figure 9. VSWR Graph for Forward Vs Reflected Power

If the reflected power indication is greater than the forward power indication, it is probable that the coupler unit has been improperly installed. Check to make sure that the coupler has not been installed backwards in the transmission line. Also make sure that the dc meter leads have not been reversed.

e. If forward and reflected power indications are equal, or reflected power is nearly equal to forward power, the swr on the line is extremely high. This usually indicates a shorted, open, or very poorly terminated line. The coupler will respond to harmonic and other spurious output as well as to rf output at the desired frequency. If the transmitter output contains a high level of spurious emission, a high swr indication may be obtained even if the transmission line is terminated properly.

3.1.4 OPERATION OF STATION CONTROL SWITCHES.

Table 2 lists operating conditions for the various settings of FUNCTION and PHONE PATCH switches in 312B-4 and 312B-5 Station Controls.

TABLE 2. OPERATION OF PHONE PATCH AND FUNCTION SWITCHES

FUNCTION SWITCH POSITIONS	PHONE PATCH SWITCH POSITIONS		
	ON	OFF	STATION MUTE
NORMAL	Speaker dead, MIC dead, PTT operative, VOX operative, patch connected.	Speaker live, MIC live, PTT operative, VOX operative, patch disconnected.	Speaker dead, MIC dead, transmitter input grounded*, PTT inoperative.
RECEIVE ONLY	Speaker dead, transmitter input grounded*, PTT inoperative, MIC dead, patch hears receiver.	Speaker live, PTT inoperative, transmitter input grounded*, patch disconnected.	Same as above.
TRANSMIT ONLY	Speaker dead, PTT operative, MIC dead, anti-vox voltage grounded.	Speaker dead, PTT operative, MIC live, anti-vox voltage grounded.	Same as above.
*PHONE PATCH OUT jack (J4) shorted.			

3.1.5 OPERATION OF VFO IN 312B-5.

The switch positions of the VFO switch designate the two oscillators as number 1 and 2. Number 1 is the vfo in the KWM-2 (or KWM-2A). Number 2 is the vfo in the 312B-5. The vfo switching arrangement allows instant selection of either of two preset frequencies within the band (one for net frequency and one for net QSY frequency), scanning for a clear channel in case of severe interference, and checking the local transmitter frequency for interference while working d-x.

a. With VFO selector switch in the REC 1 - XMIT 2 position, the receiver frequency is controlled by the dial setting of the KWM-2/2A, and the transmitter frequency is controlled by the dial setting of the 312B-5. This allows the transmit circuits to be set within one portion of the band and the receive circuits within another. For example, with the 312B-5 dial set to 14.296 MHz and the EMISSION switch on the KWM-2/2A set to TUNE, the transmit circuits may be peaked and the PA loaded. The EMISSION switch is then set back to the desired sideband or CW, and the KWM-2/2A dial tuned to a desired receiving frequency between 14.3 and 14.350 MHz. Refer to table 3.

TABLE 3
KWM-2/2A AND 312B-5 APPROXIMATE VFO FREQUENCY SEPARATION LIMITS

	BANDS MHz				
	3.4-4	7-7.4	14-14.4	21-21.6	28-30
Approximate limit of separation between 312B-5 and KWM-2/2A dials	15 kHz	30 kHz	50 kHz	75 kHz	100 kHz

b. With the VFO selector switch in the REC 1 - XMIT 1 position, both the receiver and transmitter frequencies are the same and are controlled by the vfo in the transceiver.

c. With the VFO selector switch in the REC 2 - XMIT 2 position, both the receiver and the transmitter frequencies are the same and are controlled by the vfo in the 312B-5. The vfo dial in the 312B-5 can be calibrated in this position using the crystal calibrator signal and zero set knob as outlined in the KWM-2/2A instruction book. With the 312B-5 VFO switch set in REC 1 - XMIT 1 position, the KWM-2/2A can be tuned and loaded to one selected frequency within the legal amateur band using the KWM-2/2A tuning dial. The VFO switch can then be changed to REC 2 - XMIT 2 position, and the 312B-5 dial adjusted to another selected frequency within the same band. Transceiver operation can then be changed instantly from one frequency to the other by operating the VFO switch on the 312B-5 back and forth between the two positions marked REC 1 - XMIT 1 and REC 2 - XMIT 2. This permits presetting to a net frequency and a net QSY frequency, and the instant selection of either during net operation. Frequency separation limits listed in table 1 should not be exceeded by any great extent. If they are exceeded, the result is decreased receiver sensitivity or transmitter PA grid drive (or both) due to the selectivity of the transceiver rf tuned circuits. The best compromise for this tuned circuit attenuation effect is to tune and load the KWM-2/2A at a frequency midway between the two desired frequencies and then set the 312B-5 and KWM-2/2A dials to the required frequencies.

4.1 Maintenance.

4.1.1 GENERAL.

Figure 13 shows the schematic diagram for the 312B-4 and 312B-5 Station Controls. Figures 10, 11, and 12 consist of parts identification and location for the directional coupler and phone patch used in the 312B-4 and 312B-5.

If excessive oscillator drift is experienced, replace V301. The oscillator tube V301 can be replaced without upsetting the calibration accuracy of the oscillator.

For repairs which will affect the calibration of the directional coupler, it is recommended that the unit be returned to the factory. Laboratory instruments must be used to assure accurate calibration.

4.1.2 VFO DIAL CALIBRATION.

The vfo alignment in the 312B-5 can be adjusted to coincide at the end points (0 to 200) with the vfo in the KWM-2/2A. If necessary, align the vfo in the KWM-2/2A before proceeding with the 312B-5 alignment. Refer to the Service Instructions section in the transceiver instruction book. Align the vfo in the 312B-5 as follows:

a. Set VFO switch on 312B-5 to REC 1 - XMIT 1 and FUNCTION switch to NORM.

b. Tune to zero beat with calibrate signal at 200 end of KWM-2/2A dial.

c. Set VFO switch on 312B-5 to REC 2 - XMIT 2 position.

d. Tune vfo in 312B-5 to zero beat at the 200 end of dial, and set hairline to 200 with zero set knob.

e. Repeat steps a, b, and c, at 0 end of dial in KWM-2/2A.

f. Tune vfo in 312B-5 to zero beat at 0 end of dial. Do not move the hairline. Zero beat should occur within ±1 kc of 0 on the 312B-5 dial.

g. If zero beat does not occur within the limits stated in step f, reduce the end-point spread by adjusting L302 as outlined in the KWM-2/2A Instruction Book.

h. If necessary, loosen the setscrews in the 312B-5 dial hub, and move the dial relative to the oscillator shaft so that the hairline is approximately vertical when the dial is calibrated.

i. Recheck for end-point spread, and make additional minor adjustments, if required.

j. Make the sideband frequency shift adjustment as outlined in paragraph 4.1.3.

4.1.3 VFO SIDEBAND FREQUENCY SHIFT ADJUSTMENT.

a. Set controls of 312B-5 as follows: VFO selector to REC 2 - XMIT 2, FUNCTION selector to NORM.

b. Set controls of KWM-2/2A as follows: BAND switch to 3.6, EXCITER TUNING to approximately 1.9 on logging scale, EMISSION switch to LSB, and OFF-ON-NB-CAL switch to CAL position. Tune dial near 100 until calibrate signal is zero beat. Do not move dial for following procedure.

c. Switch to USB, and adjust trimmer C308 (top of vfo can in 312B-5) for zero beat.

5.1 Specifications.

5.1.1 DIRECTIONAL COUPLER AND WATTMETER.

Frequency range . . .	2 to 30 MHz.
Impedance	52 ohms unbalanced
Wattmeter scales . . .	200 watts, forward 2000 watts, forward 200 watts, reflected 2000 watts, reflected
Size	10-3/4 inches w x 7-1/2 ft h x 11-3/4 ft d including feet
Weight	8-1/2 lb
Maximum power handling capability . .	2000 watts forward power

Power loss through coupler.	Less than 0.1 percent
Swr introduced by coupler.	Less than 1.05:1, 2 to 30 MHz

5.1.2 PHONE PATCH.

Input impedance	600 ohms
Output impedance . . .	600 ohms

5.1.3 PM SPEAKER.

Impedance	3 to 4 ohms
Size	5 by 7 inches

5.1.4 VFO IN 312B-5.

Frequency range . . .	2.5 to 2.7 MHz.
Calibration accuracy .	Within 1 kHz after midband calibration.
Drift	Less than 100 Hz after 30-minute warmup.
Dial backlash	Less than 50 Hz.
Power	Supplied by KWM-2 or KWM-2A transceiver power supply.

6.1 PARTS LIST

6.1.1 Introduction

6.1.2 General

The purpose of this parts list, prepared by Collins Radio Group of Rockwell International, is for identification, requisition, and issuance of parts.

Parts listed meet critical equipment design specification requirements. Use only part numbers specified in this parts list for replacement of parts.

6.1.3 Group Assembly Parts List

FIG - ITEM Column — Digits preceding the dash refer to figure numbers. Digits following the dash are item numbers assigned in sequence to correspond with item numbers on the illustrations.

PART NO Column — Listed are MIL standard, vendor, or Collins part numbers. Collins part numbering system consists of 10 digits as follows: 3-digit family number, a 4-digit serial number, and a 3-digit dash number.

IDENT Column — Items are coded 1, 2, 3, etc, to indicate the relationship to the next higher assembly.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, federal manufacturer's code, reference designation, attaching part (AP), reference to other figures, and effectivities.

Attaching parts are identified by (AP) following the part or parts they attach.

Effectivities are identified by the following methods: MCN (Manufacturer Control Number) 101 and up; CI (Configuration Identifier) 5-digit number; REV (Revision Identifier) dash (-) denotes original, letter A first change, letter B second change, etc. One of the above identifiers is listed on each chassis and/or replaceable assembly. Service Bulletins are identified by SB 1, SB 2, etc.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

UNITS PER ASSY Column — Quantities specified are per item number. Letters AR denote the selection of parts as required. Letters RF refer to an assembly completely assembled on a preceding figure and illustration.

6.1.4 Manufacturer's Code, Name, and Address

CODE	MANUFACTURER'S NAME AND ADDRESS
A1334	Joyner Corp. Ocoess, MN
01884	Sprague Electric Co. Dearborn Electronics Div. P.O. Box 1076 Longwood, FL 32750
02660	Bunker-Ramo Corp., The Amphenol Connector Div. 2801 S. 25th Ave. Broadview, IL 60153
03562	Bartlett - Emery Instrument Co. 14th St. and Ave. M Fort Madison, IA 52627
09922	Burndy Corp. Richards Ave. Norwalk, CT 06852
14655	Cornell-Dubilier Electronics Div. Federal Pacific Electric Co. Gov't Contracts Dept. 150 Ave. L Newark, NJ 07101
24226	Gowanda Electronics Corp. 179 Broadway Rd. Gowanda, NY 14070
46384	Penn Eng. and Mfg. Corp. Old Easton Hwy. Doylestown, PA 18901
56289	Sprague Electric Co. North Adams, MA 01247
70674	ADC Products Div. of Magnetic Controls Co. 4900 W. 78th St. Minneapolis, MN 55435

CODE	MANUFACTURER'S NAME AND ADDRESS
71450	CTS Corp. 1142 W. Beardsley Ave. Elkhart, IN 46514
71785	Cinch Mfg. Co. Div. of TRW Inc. 1501 Morse Ave. Elk Grove Village, IL 60007
72765	Drake Mfg. Co. 4626 N. Olcott Ave. Harwood Heights, IL 60656
72982	Erie Technological Products, Inc. 644 W. 12th St. Erie, PA 16512
73899	J.F.D. Electronics Corp. 15th at 62nd St. Brooklyn, NY 11219
75543	Lavelle Rubber Co. 424 N. Wood Chicago, IL 60622
76854	Oak Industries Inc. Switch Div. S. Main St. Crystal Lake, IL 60014
81349	Military Specifications
81350	Joint Army-Navy Specifications
82142	Airco Speer Electronics Div. of Air Reduction Co., Inc. Grand Plaza 945 Grand Ave. Nogales, AZ 85621
86194	Cleveland Electronics Inc. 14500 Darby Rd. Cleveland, OH 44110
95238	Continental Connector Corp. 34-63 56th St. Woodside, NY 11377
96906	Military Standards

6.1.5 Usable on Codes

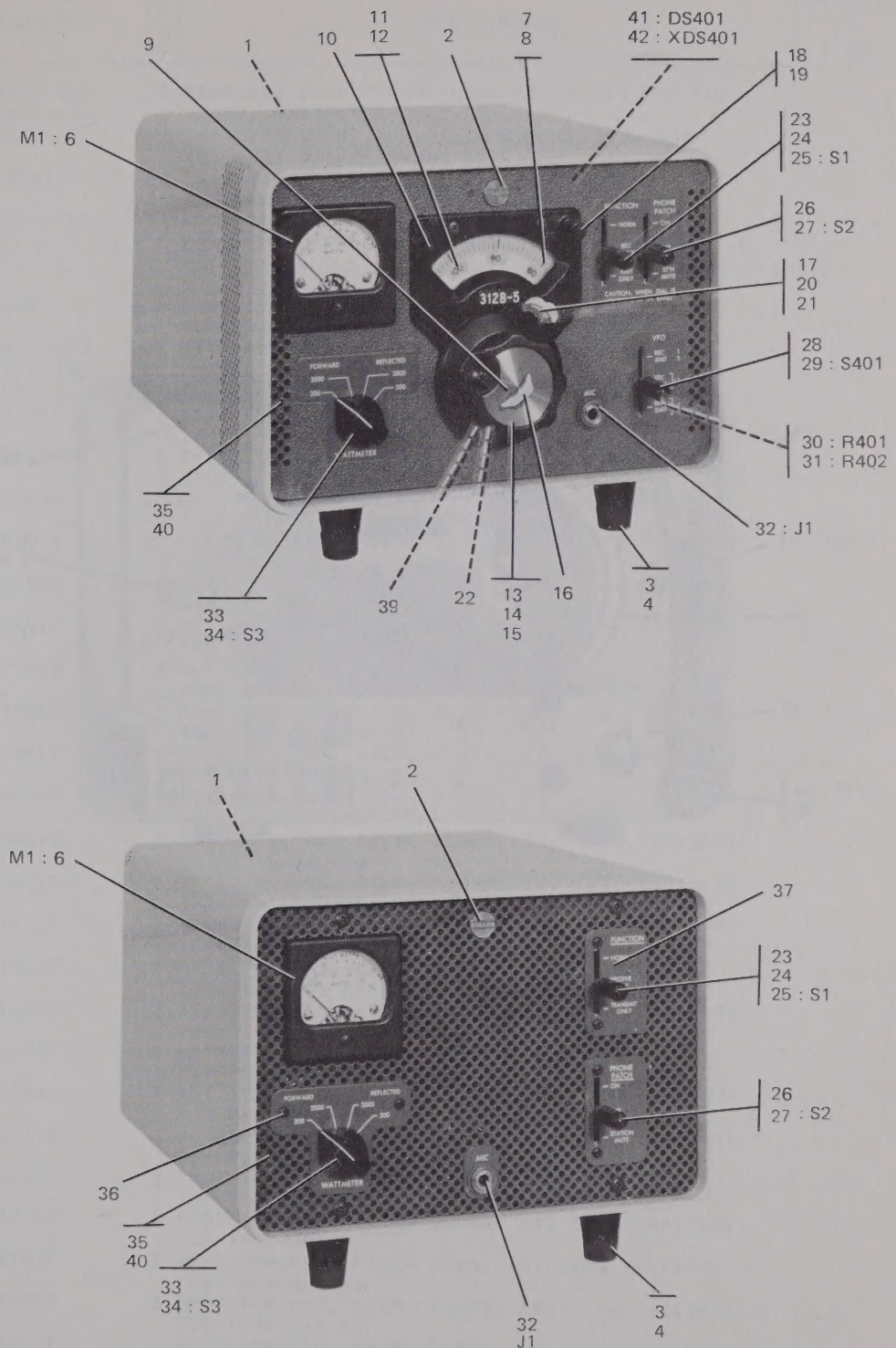
The following usable on codes have been assigned in this manual:

USABLE ON CODES	UNIT PART NUMBER	FIG-ITEM
A	522-1167-001	10-
B	522-1668-001	10-

6.1.6 Configuration Identifiers

The following CI's/REV LTR's were used in compiling data for this manual:

CI/REV LTR	UNIT PART NUMBER	FIG-ITEM
AM	522-1167-001	1-
AP	522-1668-001	1-
Z	543-8118-004	2-
N	544-3229-000	3-



TP4-7798-027

Figure 10. 312B-4/5 Station Control (Sheet 1 of 2)

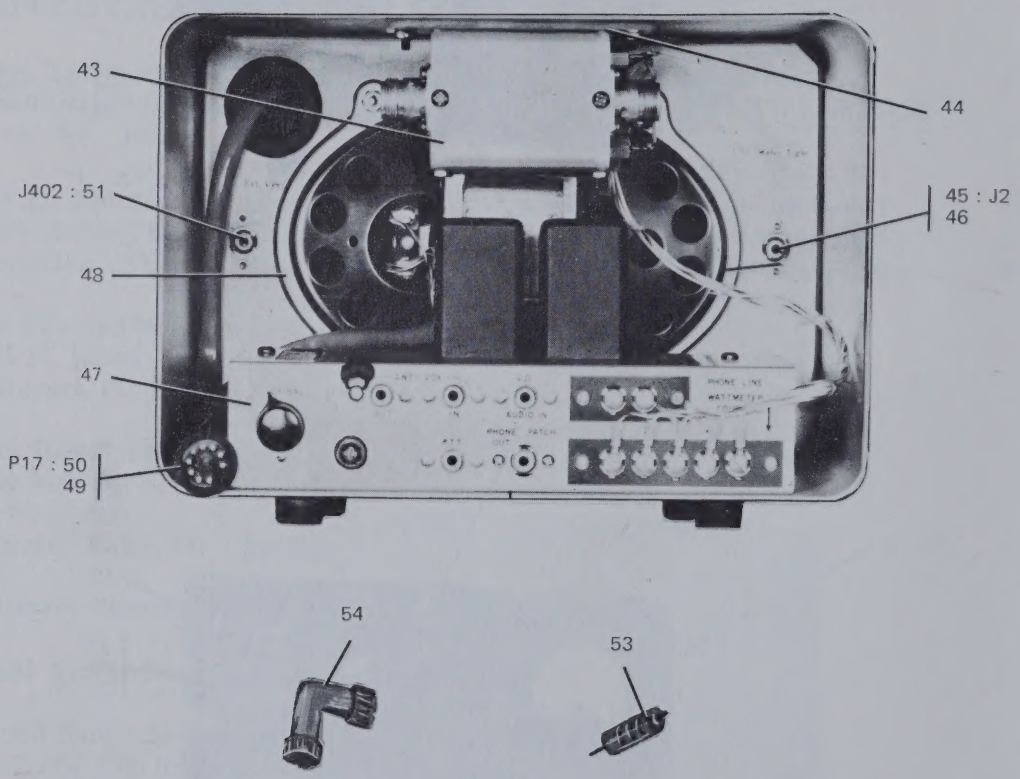


Figure 10. 312B-4/5 Station Control (Sheet 2)

FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
11	543-8118-004	1	COUPLER, DIRECTIONAL (SEE FIG 10-43 FOR NHA)		REF
1	790-0645-001	2	COVER, WATTMETER		1
2	VCJ1065D	2	CAPACITOR,VAR, AIR DIEL, 0.5 TO 3PF, 500V (V73899) 922-0149-000 C2		1
3	CB50LD511J	2	CAPACITOR,FXD, MICA DIEL, 510PF, 5%, 500V (V81349) 912-5289-010 C4		1
4	542-0916-002	2	COIL T1		1
5	M39012-04-0002	2	CONNECTOR, RCPT ELEC (V81349) 357-9003-000 J2		1
6	CB50LD511J	2	CAPACITOR, FXD MICA DIEL, 510PF, 5%, 500V (V81349) 912-5289-010 C3		1
7	VCJ1065D	2	CAPACITOR,VAR, AIR DIEL, 0.5 TO 3PF, 500V (V73899) 922-0149-000 C1		1
8	542-4114-002	2	BRACKET, CAPACITOR MTG.		2
9	542-4115-002	2	PLATE, CAPACITOR MTG		1
10	542-4117-002	2	COVER, CHASSIS		1
11	RN65D5361F	2	RESISTOR,FXD, FILM, 5.36K, 1%, 1/2W (V81349) 705-7131-000 R3		AR
11	RN65D5621F	2	RESISTOR,FXD, FILM, 5.62K, 1%, 1/2W (V81349) 705-7132-000 R3		AR
11	RN65D5901F	2	RESISTOR,FXD, FILM, 5.9K, 1%, 1/2W (V81349) 705-7133-000 R3		AR
11	RN65D6191F	2	RESISTOR,FXD, FILM, 6.19K, 1%, 1/2W (V81349) 705-7134-000 R3		AR
11	RN65D6491F	2	RESISTOR,FXD, FILM, 6.49K, 1%, 1/2W (V81349) 705-7135-000 R3		AR
11	RN65D6811F	2	RESISTOR,FXD, FILM, 6.81K, 1%, 1/2W (V81349) 705-7136-000 R3		AR
11	RN65D7151F	2	RESISTOR,FXD, FILM, 7.15K, 1%, 1/2W (V81349) 705-7137-000 R3		AR
11	RN65D7501F	2	RESISTOR,FXD, FILM, 7.5K, 1%, 1/2W (V81349) 705-7138-000 R3		AR
11	RN65D7871F	2	RESISTOR,FXD, FILM, 7.87K, 1%, 1/2W (V81349) 705-7139-000 R3		AR
11	RN65D8251F	2	RESISTOR,FXD, FILM, 8.25K, 1%, 1/2W (V81349) 705-7140-000 R3		AR
11	RN65D8661F	2	RESISTOR,FXD, FILM, 8.66K, 1%, 1/2W (V81349) 705-7141-000 R3		AR
11	RN65D9091F	2	RESISTOR,FXD, FILM, 9.09K, 1%, 1/2W (V81349) 705-7142-000 R3		AR
11	RN65D9531F	2	RESISTOR,FXD, FILM, 9.53K, 1%, 1/2W (V81349) 705-7143-000 R3		AR
11	RN65D1002F	2	RESISTOR,FXD, FILM, 10K, 1%, 1/2W (V81349) 705-7144-000 R3		AR
11	RN65D1052F	2	RESISTOR,FXD, FILM, 10.5K, 1%, 1/2W (V81349) 705-7145-000 R3		AR
11	RN65D1102F	2	RESISTOR,FXD, FILM, 11K, 1%, 1/2W (V81349) 705-7146-000 R3		AR
11	RN65D1152F	2	RESISTOR,FXD, FILM, 11.5K, 1%, 1/2W (V81349) 705-7147-000 R3		AR
11	RN65D1212F	2	RESISTOR,FXD, FILM, 12.1K, 1%, 1/2W (V81349) 705-7148-000 R3		AR
12	RN65D1001F	2	RESISTOR,FXD, FILM, 1K, 1%, 1/2W (V81349) 705-7096-000 R5		AR
12	RN65D1051F	2	RESISTOR,FXD, FILM, 1.05K, 1%, 1/2W (V81349) 705-7097-000 R5		AR
12	RN65D1101F	2	RESISTOR,FXD, FILM, 1.1K, 1%, 1/2W (V81349) 705-7098-000 R5		AR
12	RN65D1151F	2	RESISTOR,FXD, FILM, 1.15K, 1%, 1/2W (V81349) 705-7099-000 R5		AR
12	RN65D1211F	2	RESISTOR,FXD, FILM, 1.21K, 1%, 1/2W (V81349) 705-7100-000 R5		AR
12	RN65D1271F	2	RESISTOR,FXD, FILM, 1.27K, 1%, 1/2W (V81349) 705-7101-000 R5		AR

GROUP ASSEMBLY PARTS LIST

FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
11 12	RN65D1331F	2	RESISTOR,FXD, FILM, 1.33K, 1%, 1/2W (V81349) 705-7102-000 R5		AR
12	RN65D1401F	2	RESISTOR,FXD, FILM, 1.4K, 1%, 1/2W (V81349) 705-7103-000 R5		AR
12	RN65D1471F	2	RESISTOR,FXD, FILM, 1.47K, 1%, 1/2W (V81349) 705-7104-000 R5		AR
12	RN65D1541F	2	RESISTOR,FXD, FILM, 1.54K, 1%, 1/2W (V81349) 705-7105-000 R5		AR
12	RN65D1621F	2	RESISTOR,FXD, FILM, 1.62K, 1%, 1/2W (V81349) 705-7106-000 R5		AR
12	RN65D1691F	2	RESISTOR,FXD, FILM, 1.69K, 1%, 1/2W (V81349) 705-7107-000 R5		AR
12	RN65D1781F	2	RESISTOR,FXD, FILM, 1.78K, 1%, 1/2W (V81349) 705-7108-000 R5		AR
12	RN65D1871F	2	RESISTOR,FXD, FILM, 1.87K, 1%, 1/2W (V81349) 705-7109-000 R5		AR
12	RN65D1961F	2	RESISTOR,FXD, FILM, 1.96K, 1%, 1/2W (V81349) 705-7110-000 R5		AR
12	RN65D2051F	2	RESISTOR,FXD, FILM, 2.05K, 1%, 1/2W (V81349) 705-7111-000 R5		AR
12	RN65D2151F	2	RESISTOR,FXD, FILM, 2.15K, 1%, 1/2W (V81349) 705-7112-000 R5		AR
12	RN65D2261F	2	RESISTOR,FXD, FILM, 2.26K, 1%, 1/2W (V81349) 705-7113-000 R5		AR
12	RN65D2371F	2	RESISTOR,FXD, FILM, 2.37K, 1%, 1/2W (V81349) 705-7114-000 R5		AR
12	RN65D2491F	2	RESISTOR,FXD, FILM, 2.49K, 1%, 1/2W (V81349) 705-7115-000 R5		AR
13	1N82AG	2	SEMICOND DEVICE (V81350) 353-9012-010 CR1		1
14	10205-3	2	COIL,RF, 220UH (V82142) 240-0037-000 L1		1
15	ST1050-34	2	TERMINAL,STUD (V95238) 306-0091-000		4
16	RN65D12R1F	2	RESISTOR,FXD, FILM, 12.1 OHMS, 1%, 1/2W (V81349) 705-7004-000 R1		1
17	CC30LH430F	2	CAPACITOR,FXD, CER DIEL, 43PF, 1%, 500V (V81349) 916-4675-000 C5		1
18	CC30LH430F	2	CAPACITOR,FXD, CER DIEL, 43PF, 1%, 500V (V81349) 916-4675-000 C6		1
19	RN65D12R1F	2	RESISTOR,FXD, FILM, 12.1 OHMS, 1%, 1/2W (V81349) 705-7004-000 R2		1
20	10205-3	2	COIL,RF, 220UH (V82142) 240-0037-000 L2		1
21	1N82AG	2	SEMICOND DEVICE (V81350) 353-9012-010 CR2		1
22	RN65D5361F	2	RESISTOR,FXD, FILM, 5.36K, 1%, 1/2W (V81349) 705-7131-000 R4		AR
22	RN65D5621F	2	RESISTOR,FXD, FILM, 5.62K, 1%, 1/2W (V81349) 705-7132-000 R4		AR
22	RN65D5901F	2	RESISTOR,FXD, FILM, 5.9K, 1%, 1/2W (V81349) 705-7133-000 R4		AR
22	RN65D6191F	2	RESISTOR,FXD, FILM, 6.19K, 1%, 1/2W (V81349) 705-7134-000 R4		AR
22	RN65D6491F	2	RESISTOR,FXD, FILM, 6.49K, 1%, 1/2W (V81349) 705-7135-000 R4		AR
22	RN65D6811F	2	RESISTOR,FXD, FILM, 6.81K, 1%, 1/2W (V81349) 705-7136-000 R4		AR
22	RN65D7151F	2	RESISTOR,FXD, FILM, 7.15K, 1%, 1/2W (V81349) 705-7137-000 R4		AR
22	RN65D7501F	2	RESISTOR,FXD, FILM, 7.5K, 1%, 1/2W (V81349) 705-7138-000 R4		AR
22	RN65D7871F	2	RESISTOR,FXD, FILM, 7.87K, 1%, 1/2W (V81349) 705-7139-000 R4		AR
22	RN65D8251F	2	RESISTOR,FXD, FILM, 8.25K, 1%, 1/2W (V81349) 705-7140-000 R4		AR
22	RN65D8661F	2	RESISTOR,FXD, FILM, 8.66K, 1%, 1/2W (V81349) 705-7141-000 R4		AR

GROUP ASSEMBLY PARTS LIST

FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
11 22	RN65D9091F	2	RESISTOR,FXD, FILM, 9.09K, 1%, 1/2W (V81349) 705-7142-000 R4		AR
22	RN65D9531F	2	RESISTOR,FXD, FILM, 9.53K, 1%, 1/2W (V81349) 705-7143-000 R4		AR
22	RN65D1002F	2	RESISTOR,FXD, FILM, 10K, 1%, 1/2W (V81349) 705-7144-000 R4		AR
22	RN65D1052F	2	RESISTOR,FXD, FILM, 10.5K, 1%, 1/2W (V81349) 705-7145-000 R4		AR
22	RN65D1102F	2	RESISTOR,FXD, FILM, 11K, 1%, 1/2W (V81349) 705-7146-000 R4		AR
22	RN65D1152F	2	RESISTOR,FXD, FILM, 11.5K, 1%, 1/2W (V81349) 705-7147-000 R4		AR
22	RN65D1212F	2	RESISTOR,FXD, FILM, 12.1K, 1%, 1/2W (V81349) 705-7148-000 R4		AR
23	RN65D1001F	2	RESISTOR,FXD, FILM, 1K, 1%, 1/2W (V81349) 705-7096-000 R6		AR
23	RN65D1051F	2	RESISTOR,FXD, FILM, 1.05K, 1%, 1/2W (V81349) 705-7097-000 R6		AR
23	RN65D1101F	2	RESISTOR,FXD, FILM, 1.1K, 1%, 1/2W (V81349) 705-7098-000 R6		AR
23	RN65D1151F	2	RESISTOR,FXD, FILM, 1.15K, 1%, 1/2W (V81349) 705-7099-000 R6		AR
23	RN65D1211F	2	RESISTOR,FXD, FILM, 1.21K, 1%, 1/2W (V81349) 705-7100-000 R6		AR
23	RN65D1271F	2	RESISTOR,FXD, FILM, 1.27K, 1%, 1/2W (V81349) 705-7101-000 R6		AR
23	RN65D1331F	2	RESISTOR,FXD, FILM, 1.33K, 1%, 1/2W (V81349) 705-7102-000 R6		AR
23	RN65D1401F	2	RESISTOR,FXD, FILM, 1.4K, 1%, 1/2W (V81349) 705-7103-000 R6		AR
23	RN65D1471F	2	RESISTOR,FXD, FILM, 1.47K, 1%, 1/2W (V81349) 705-7104-000 R6		AR
23	RN65D1541F	2	RESISTOR,FXD, FILM, 1.54K, 1%, 1/2W (V81349) 705-7105-000 R6		AR
23	RN65D1621F	2	RESISTOR,FXD, FILM, 1.62K, 1%, 1/2W (V81349) 705-7106-000 R6		AR
23	RN65D1691F	2	RESISTOR,FXD, FILM, 1.69K, 1%, 1/2W (V81349) 705-7107-000 R6		AR
23	RN65D1781F	2	RESISTOR,FXD, FILM, 1.78K, 1%, 1/2W (V81349) 705-7108-000 R6		AR
23	RN65D1871F	2	RESISTOR,FXD, FILM, 1.87K, 1%, 1/2W (V81349) 705-7109-000 R6		AR
23	RN65D1961F	2	RESISTOR,FXD, FILM, 1.96K, 1%, 1/2W (V81349) 705-7110-000 R6		AR
23	RN65D2051F	2	RESISTOR,FXD, FILM, 2.05K, 1%, 1/2W (V81349) 705-7111-000 R6		AR
23	RN65D2151F	2	RESISTOR,FXD, FILM, 2.15K, 1%, 1/2W (V81349) 705-7112-000 R6		AR
23	RN65D2261F	2	RESISTOR,FXD, FILM, 2.26K, 1%, 1/2W (V81349) 705-7113-000 R6		AR
23	RN65D2371F	2	RESISTOR,FXD, FILM, 2.37K, 1%, 1/2W (V81349) 705-7114-000 R6		AR
23	RN65D2491F	2	RESISTOR,FXD, FILM, 2.49K, 1%, 1/2W (V81349) 705-7115-000 R6		AR
24	327-029X5T0102Z	2	CAPACITOR,FXD, CER DIEL, 1000PF, M20%P80%, 500V (V72982) 913-1292-000 C10		1
25	327-029X5T0102Z	2	CAPACITOR,FXD, CER DIEL, 1000PF, M20%P80%, 500V (V72982) 913-1292-000 C9		1
26	M39012-04-0002	2	CONNECTOR,RCPT, ELEC (V81349) 357-9003-000 J1		1
27	327-029X5T0102Z	2	CAPACITOR,FXD, CER DIEL, 1000PF, M20%P80%, 500V (V72982) 913-1292-000 C8		1
28	327-029X5T0102Z	2	CAPACITOR,FXD, CER DIEL, 1000PF, M20%P80%, 500V (V72982) 913-1292-000 C7		1
29	790-0647-001	2	CHASSIS, COUPLER DIRECTIONAL		1

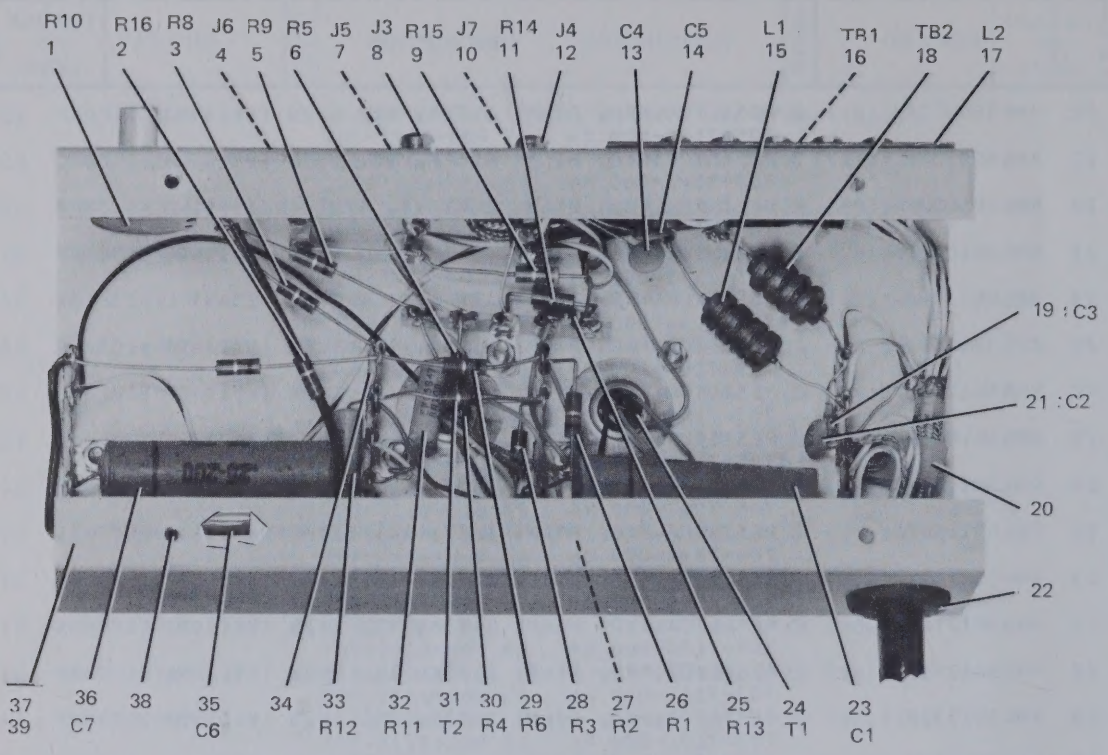


Figure 12. Phone Patch Chassis

FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
12	544-3229-000	1	CHASSIS, PHONE PATCH (SEE FIG 10-47 FOR NHA)		REF
1	376-4728-000	2	RESISTOR,VAR, 2.5K, 20%, 1/4W (V71450) 376-4728-000 R10		1
2	RCR20G271KS	2	RESISTOR,FXD, CMPSN, 270 OHMS, 10%, 1/2W (V81349) 745-1328-000 R16		1
3	RCR20G821KS	2	RESISTOR,FXD, CMPSN, 820 OHMS, 10%, 1/2W (V81349) 745-1349-000 R8		1
4	201-11-01-018	2	JACK,PHONO (V71785) 360-0088-000 J6		1
5	RCR20G101KS	2	RESISTOR,FXD, CMPSN, 100 OHMS, 10%, 1/2W (V81349) 745-1310-000 R9		1
6	RCR20G101KS	2	RESISTOR,FXD, CMPSN, 100 OHMS, 10%, 1/2W (V81349) 745-1310-000 R5		1
7	201-11-01-018	2	JACK,PHONO (V71785) 360-0088-000 J5		1
8	201-11-01-018	2	JACK,PHONO (V71785) 360-0088-000 J3		1
9	RCR20G391KS	2	RESISTOR,FXD, CMPSN, 390 OHMS, 10%, 1/2W (V81349) 745-1335-000 R15		1
10	201-11-01-018	2	JACK,PHONO (V71785) 360-0088-000 J7		1
11	RCR20G271KS	2	RESISTOR,FXD, CMPSN, 270 OHMS, 10%, 1/2W (V81349) 745-1328-000 R14		1
12	201-11-01-018	2	JACK,PHONO (V71785) 360-0088-000 J4		1
13	19C372	2	CAPACITOR,FXD, CER DIEL, 470PF, 20%, 500V (V56289) 913-3007-000 C4		1

GROUP ASSEMBLY PARTS LIST

FIG - ITEM		PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
12	14	19C372	2	CAPACITOR,FXD, CER DIEL, 470PF, 20%, 500V (V56289) 913-3007-000 C5		1
	15	9348	2	COIL,RF, 2MH (V24226) 240-0134-000 L1		1
	16	1781	2	TERMINAL BOARD (V71785) 306-0032-000 TB1		1
	17	9348	2	COIL,RF, 2MH (V24226) 240-0134-000 L2		1
	18	1775	2	TERMINAL BOARD (V71785) 306-0035-000 TB2		1
	19	19C372	2	CAPACITOR,FXD, CER DIEL, 470PF, 20%, 500V (V56289) 913-3007-000 C3		1
	20	HP6N	2	CLAMP,LOOP (V09922) 150-1543-000		1
	21	19C372	2	CAPACITOR,FXD, CER DIEL, 470PF, 20%, 500V (V56289) 913-3007-000 C2		1
	22	MS35489-11	2	GROMMET,RBR (V96906) 201-0004-000		1
	23	931-0170-000	2	CAPACITOR,FXD, PPR DIEL, 1UF, 10%, 400V (V14655) 931-0170-000 C1		1
	24	A15406	2	TRANSFORMER,AF (V70674) 667-0326-000 T1		1
	25	RCR20G391KS	2	RESISTOR,FXD, CMPSN, 390 OHMS, 10%, 1/2W (V81349) 745-1335-000 R13		1
	26	RCR20G101KS	2	RESISTOR,FXD, CMPSN, 100 OHMS, 10%, 1/2W (V81349) 745-1310-000 R1		1
	27	RCR20G101KS	2	RESISTOR,FXD, CMPSN, 100 OHMS, 10%, 1/2W (V81349) 745-1310-000 R2		1
	28	RCR20G821KS	2	RESISTOR,FXD, CMPSN, 820 OHMS, 10%, 1/2W (V81349) 745-1349-000 R3		1
	29	RCR20G101KS	2	RESISTOR,FXD, CMPSN, 100 OHMS, 10%, 1/2W (V81349) 745-1310-000 R6		1
	30	A15406	2	TRANSFORMER,AF (V70674) 667-0326-000 T2		1
	31	RCR20G101KS	2	RESISTOR,FXD, CMPSN, 100 OHMS, 10%, 1/2W (V81349) 745-1310-000 R4		1
	32	RN70D6190F	2	RESISTOR,FXD, FILM, 619 OHMS, 1%, 3/4W (V81349) 705-7586-000 R11		1
	33	RN70D6190F	2	RESISTOR,FXD, FILM, 619 OHMS, 1%, 3/4W (V81349) 705-7586-000 R12		1
	34	1542A	2	TERMINAL BOARD (V71785) 306-0550-000		5
	35	931-0169-000	2	CAPACITOR,FXD, PPR DIEL, 0.47UF, 10%, 400V (V14655) 931-0169-000 C6		1
	36	LP9A1E224K	2	CAPACITOR,FXD, PLSTC DIEL, 0.22UF, 10%, 400V (V01884) 933-1043-650 C7		1
	37	544-3230-000	2	CHASSIS		1
	38	CL632-1C	3	NUT,PLAIN, CD PL STL, 6-32 (V46384) 334-0065-000		4
	39	544-2851-003	3	CHASSIS		1

6.1.8 Numerical Index

PART NUMBER	FIG - ITEM	TTL REQ
A15406	12-24	1
	12-30	1
CB50LD511J	11-3	1
	11-6	1
CC30LH430F	11-17	1
	11-18	1
CL632-1C	12-38	4
HP6N	12-20	1
LP9A1E224K	12-36	1
MS15571-2	10-41	1
MS35489-11	12-22	1
M39012-04-0002	11-5	1
	11-26	1
M39012-05-0001	10-54	1
M641-5-1	10-32	1
RCR20G101KS	12-5	1
	12-6	1
	12-26	1
	12-27	1
	12-29	1
	12-31	1
RCR20G271KS	12-2	1
	12-11	1
RCR20G391KS	12-9	1
	12-25	1
RCR20G821KS	12-3	1
	12-28	1
RCR32G153KS	10-30	1
RCR42G333KS	10-31	1
RN65D1001F	11-12	AR
	11-23	AR
RN65D1002F	11-11	AR
	11-22	AR
RN65D1051F	11-12	AR
	11-23	AR
RN65D1052F	11-11	AR
	11-22	AR
RN65D1101F	11-12	AR
	11-23	AR
RN65D1102F	11-11	AR
	11-22	AR
RN65D1151F	11-12	AR
	11-23	AR
RN65D1152F	11-11	AR
	11-22	AR
RN65D12R1F	11-16	1
	11-19	1
RN65D1211F	11-12	AR
	11-23	AR
RN65D1212F	11-11	AR
	11-22	AR
RN65D1271F	11-12	AR
	11-23	AR
RN65D1331F	11-12	AR
	11-23	AR
RN65D1401F	11-12	AR
	11-23	AR
RN65D1471F	11-12	AR
	11-23	AR
RN65D1541F	11-12	AR
	11-23	AR
RN65D1621F	11-12	AR
	11-23	AR
RN65D1691F	11-12	AR
	11-23	AR

PART NUMBER	FIG - ITEM	TTL REQ
RN65D1781F	11-12	AR
	11-23	AR
RN65D1871F	11-12	AR
	11-23	AR
RN65D1961F	11-12	AR
	11-23	AR
RN65D2051F	11-12	AR
	11-23	AR
RN65D2151F	11-12	AR
	11-23	AR
RN65D2261F	11-12	AR
	11-23	AR
RN65D2371F	11-12	AR
	11-23	AR
RN65D2491F	11-12	AR
	11-23	AR
RN65D5361F	11-11	AR
	11-22	AR
RN65D5621F	11-11	AR
	11-22	AR
RN65D5901F	11-11	AR
	11-22	AR
RN65D6191F	11-11	AR
	11-22	AR
RN65D6491F	11-11	AR
	11-22	AR
RN65D6811F	11-11	AR
	11-22	AR
RN65D7151F	11-11	AR
	11-22	AR
RN65D7501F	11-11	AR
	11-22	AR
RN65D7871F	11-11	AR
	11-22	AR
RN65D8251F	11-11	AR
	11-22	AR
RN65D8661F	11-11	AR
	11-22	AR
RN65D9091F	11-11	AR
	11-22	AR
RN65D9531F	11-11	AR
	11-22	AR
RN70D6190F	12-32	1
	12-33	1
ST1050-34	11-15	4
VCJ1065D	11-2	1
	11-7	1
X6496	10-48	1
1N82AG	11-13	1
	11-21	1
10205-3	11-14	1
	11-20	1
103080-187N1	10-29	1
103081-187J1	10-25	1
103082-187N1	10-27	1
1542A	12-34	5
1775	12-18	1
1781	12-16	1
19C372	12-13	1
	12-14	1
	12-19	1
	12-21	1
192971F1	10-34	1

PART NUMBER	FIG - ITEM	TTL REQ
201-11-01-018	10-45	1
	10-51	1
	12-4	1
	12-7	1
	12-8	1
	12-10	1
	12-12	1
280-3423-00	10-2	1
327-029X5T0102Z	11-24	1
	11-25	1
	11-27	1
	11-28	1
357-9003-002	11-5	1
376-4728-000	12-1	1
4159-043	10-42	1
458-0467-000	10-6	1
522-1093-000	10-22	1
522-1167-001	10-	1
522-1668-001	10-	1
542-0916-002	11-4	1
542-4114-002	11-8	2
542-4115-002	11-9	1
542-4117-002	11-10	1
543-8033-002	10-19	1
543-8034-002	10-18	1
543-8035-000	10-13	1
543-8039-000	10-33	1
543-8042-000	10-8	1
543-8076-002	10-17	1
543-8078-002	10-7	1
543-8080-002	10-39	1
543-8084-002	10-20	1
543-8093-003	10-11	1
543-8101-002	10-4	4
543-8104-002	10-16	1
543-8112-005	10-5	1
543-8114-003	10-40	1
543-8117-003	10-35	1
543-8118-004	10-43	1
	11-	REF
544-2405-002	10-44	1
544-2422-002	10-46	1
544-2851-003	12-39	1
544-2852-000	10-24	1
	10-26	1
	10-28	1
544-2853-000	10-52	1
544-3128-002	10-12	1
544-3223-002	10-38	1
544-3228-000	10-23	1
544-3229-000	10-47	1
	12-	REF
544-3230-000	12-37	1
544-3234-002	10-36	1
545-6104-000	10-35	1
545-6108-004	10-40	1
545-6117-005	10-5	1
	10-52	1
546-4050-000	10-49	1
546-7823-004	10-21	1
546-7829-004	10-15	1
548-1339-002	10-37	2
548-9326-000	10-14	1

PART NUMBER	FIG - ITEM	TTL REQ
553-5711-004	10-10	1
553-5787-003	10-9	1
747RBLACK	10-3	4
757-4780-000	10-1	1
757-5023-000	10-1	
790-0123-001	10-23	1
790-0645-001	11-1	1
790-0647-001	11-29	1
86-897	10-50	1
912-2589-010	11-6	1
931-0169-000	10-53	1
	12-35	1
931-0170-000	12-23	1
9348	12-15	1
	12-17	1

6.1.9 Reference Designation Index

REFERENCE DESIGNATION	FIG - ITEM	PART NUMBER
CR1	11-13	1N82AG
CR2	11-21	1N82AG
C1	11-7	VCJ1065D
C1	12-23	931-0170-000
C10	11-24	327-029X5T0102Z
C2	11-2	VCJ1065D
C2	12-21	19C372
C3	11-6	CB50LD511J
C3	12-19	19C372
C4	11-3	CB50LD511J
C4	12-13	19C372
C5	11-17	CC30LH430F
C5	12-14	19C372
C6	11-18	CC30LH430F
C6	12-35	931-0169-000
C7	11-28	327-029X5T0102Z
C7	12-36	LP9A1E224K
C8	11-27	327-029X5T0102Z
C9	11-25	327-029X5T0102Z
DS401	10-41	MS15571-2
J1	10-32	M641-5-1
J1	11-26	M39012-04-0002
J2	10-45	201-11-01-018
J2	11-5	M39012-04-0002
J3	12-8	201-11-01-018
J4	12-12	201-11-01-018
J402	10-51	201-11-01-018
J5	12-7	201-11-01-018
J6	12-4	201-11-01-018
J7	12-10	201-11-01-018
LS1	10-48	X6496
L1	11-14	10205-3
L1	12-15	9348
L2	11-20	10205-3
L2	12-17	9348
M1	10-6	458-0467-000
P17	10-50	86-897
R1	11-16	RN65D12R1F
R1	12-26	RCR20G101KS
R10	12-1	376-4728-000
R11	12-32	RN70D6190F
R12	12-33	RN70D6190F
R13	12-25	RCR20G391KS
R14	12-11	RCR20G271KS
R15	12-9	RCR20G391KS
R16	12-2	RCR20G271KS
R2	11-19	RN65D12R1F
R2	11-27	RCR20G101KS
R3	11-11	RN65D5361F
R3	11-11	RN65D5621F
R3	11-11	RN65D5901F
R3	11-11	RN65D6191F
R3	11-11	RN65D6491F
R3	11-11	RN65D6811F
R3	11-11	RN65D7151F
R3	11-11	RN65D7501F
R3	11-11	RN65D7871F
R3	11-11	RN65D8251F
R3	11-11	RN65D8661F
R3	11-11	RN65D9091F
R3	11-11	RN65D9531F
R3	11-11	RN65D1002F
R3	11-11	RN65D1052F

REFERENCE DESIGNATION	FIG - ITEM	PART NUMBER
R3	11-11	RN65D1102F
R3	11-11	RN65D1152F
R3	11-11	RN65D1212F
R3	12-28	RCR20G821KS
R4	11-22	RN65D5361F
R4	11-22	RN65D5621F
R4	11-22	RN65D5901F
R4	11-22	RN65D6191F
R4	11-22	RN65D6491F
R4	11-22	RN65D6811F
R4	11-22	RN65D7151F
R4	11-22	RN65D7501F
R4	11-22	RN65D7871F
R4	11-22	RN65D8251F
R4	11-22	RN65D8661F
R4	11-22	RN65D9091F
R4	11-22	RN65D9531F
R4	11-22	RN65D1002F
R4	11-22	RN65D1052F
R4	11-22	RN65D1102F
R4	11-22	RN65D1152F
R4	11-22	RN65D1212F
R4	12-31	RCR20G101KS
R401	10-30	RCR32G153KS
R402	10-31	RCR42G333KS
R5	11-12	RN65D1001F
R5	11-12	RN65D1051F
R5	11-12	RN65D1101F
R5	11-12	RN65D1151F
R5	11-12	RN65D1211F
R5	11-12	RN65D1271F
R5	11-12	RN65D1331F
R5	11-12	RN65D1401F
R5	11-12	RN65D1471F
R5	11-12	RN65D1541F
R5	11-12	RN65D1621F
R5	11-12	RN65D1691F
R5	11-12	RN65D1781F
R5	11-12	RN65D1871F
R5	11-12	RN65D1961F
R5	11-12	RN65D2051F
R5	11-12	RN65D2151F
R5	11-12	RN65D2261F
R5	11-12	RN65D2371F
R5	11-12	RN65D2491F
R5	12-6	RCR20G101KS
R6	11-23	RN65D1001F
R6	11-23	RN65D1051F
R6	11-23	RN65D1101F
R6	11-23	RN65D1151F
R6	11-23	RN65D1211F
R6	11-23	RN65D1271F
R6	11-23	RN65D1331F
R6	11-23	RN65D1401F
R6	11-23	RN65D1471F
R6	11-23	RN65D1541F
R6	11-23	RN65D1621F
R6	11-23	RN65D1691F
R6	11-23	RN65D1781F
R6	11-23	RN65D1871F
R6	11-23	RN65D1961F
R6	11-23	RN65D2051F
R6	11-23	RN65D2151F

REFERENCE DESIGNATION	FIG - ITEM	PART NUMBER
R6	11-23	RN65D2261F
R6	11-23	RN65D2371F
R6	11-23	RN65D2491F
R6	12-29	RCR20G101KS
R8	12-3	RCR20G821KS
R9	12-5	RCR20G101KS
S1	10-25	103081-187J1
S2	10-27	103082-187N1
S3	10-34	192971F1
S401	10-29	103080-187N1
TB1	12-16	1781
TB2	12-18	1775
T1	11-4	542-0916-002
T1	12-24	A15406
T2	12-30	A15406
XDS401	10-42	4159-043

REFERENCE DESIGNATION	FIG - ITEM	PART NUMBER

Rockwell
International

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International